Patent claims

1. Compounds of formula 1

in which

R1 is 1-4C-alkyl and

R2 is 1-4C-alkyl,

R3 represents a phenyl derivative of formulae (a) or (b)

wherein

R4 is 1-4C-alkoxy or 1-4C-alkoxy which is completely or predominantly substituted by fluorine,

R5 is 1-8C-alkoxy, 3-7C-cycloalkoxy, 3-7C-cycloalkylmethoxy, or 1-4C-alkoxy which is completely or predominantly substituted by fluorine,

R6 is 1-4C-alkoxy, 3-5C-cycloalkoxy, 3-5C-cycloalkylmethoxy, or 1-4C-alkoxy which is completely or predominantly substituted by fluorine,

R7 is 1-4C-alkyl and

R8 is hydrogen or 1-4C-alkyl,

or wherein

R7 and R8 together and with inclusion of the two carbon atoms, to which they are bonded, form a spiro-linked 5-, 6- or 7-membered hydrocarbon ring, optionally interrupted by an oxygen or sulphur atom.

R9 is -C(O)R10, -S(O)₂-R14, -(CH₂)_n-C(O)-R18 or -C(O)-(CH₂)_m-R21,

R10 is 1-4C-alkyl, -N(R11)R12, phenyl or phenyl substituted by R13,

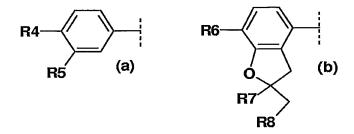
- R11 is hydrogen, 1-4C-alkyl, 3-7C-cycloalkyl or 3-7C-cycloalkylmethyl,
- R12 is hydrogen, 1-4C-alkyl, 3-7C-cycloalkyl or 3-7C-cycloalkylmethyl,
- or R11 and R12 together and with inclusion of the nitrogen atom to which they are bonded, form a 1-pyrrolidinyl-, 1-piperidinyl-, 1-piperazinyl, 1-(1-4C-alkyl)-piperazin-4-yl-, 1-hexahydroazepinyl-, 4-morpholinyl, 4-thiomorpholinyl-, thiomorpholin-1-oxide-4-yl- or thiomorpholin-1,1-dioxide-4-yl-ring,
- R13 is hydroxyl, halogen, nitro, cyano, hydroxycarbonyl, 1-4C-alkyl, trifluoromethyl, 1-4C-alkoxy, 1-4C-alkoxy which is completely or predominantly substituted by fluorine, 1-4C-alkoxycarbonyl, amino, mono- or di-1-4C-alkylamino, aminocarbonyl, mono- or di-1-4C-alkylaminocarbonyl, 1-4C-alkylcarbonyl, 1-4C-alkylcarbonyl, 1-4C-alkylcarbonyloxy,
- R14 is 1-4C-alkyl, -N(R15)R16, phenyl or phenyl substituted by R17,
- R15 is hydrogen, 1-4C-alkyl, 3-7C-cycloalkyl or 3-7C-cycloalkylmethyl,
- R16 is hydrogen, 1-4C-alkyl, 3-7C-cycloalkyl or 3-7C-cycloalkylmethyl,
- or R15 and R16 together and with inclusion of the nitrogen atom to which they are bonded, form a 1-pyrrolidinyl-, 1-piperidinyl-, 1-piperazinyl, 1-(1-4C-alkyl)-piperazin-4-yl-, 1-hexahydroazepinyl-, 4-morpholinyl, 4-thiomorpholinyl-, thiomorpholin-1-oxide-4-yl- or thiomorpholin-1,1-dioxide-4-yl-ring,
- R17 is hydroxyl, halogen, nitro, cyano, carboxyl, 1-4C-alkyl, trifluoromethyl, 1-4C-alkoxy, 1-4C-alkoxy which is completely or predominantly substituted by fluorine, 1-4C-alkoxycarbonyl, amino, monoor di-1-4C-alkylamino, aminocarbonyl, mono- or di-1-4C-alkylaminocarbonyl, 1-4C-alkylcarbonyl, 1-4C-alkylcarbonylamino or 1-4C-alkylcarbonyloxy,
- R18 is -N(R19)R20,
- R19 is hydrogen, 1-4C-alkyl, 3-7C-cycloalkyl or 3-7C-cycloalkylmethyl,
- R20 is hydrogen, 1-4C-alkyl, 3-7C-cycloalkyl or 3-7C-cycloalkylmethyl,
- or R19 and R20 together and with inclusion of the nitrogen atom to which they are bonded, form a 1-pyrrolidinyl-, 1-piperidinyl-, 1-piperazinyl, 1-(1-4C-alkyl)-piperazin-4-yl-, 1-hexahydroazepinyl-, 4-morpholinyl, 4-thiomorpholinyl-, thiomorpholin-1-oxide-4-yl- or thiomorpholin-1,1-dioxide-4-yl-ring,
- R21 is -N(R22)R23,
- R22 is hydrogen, 1-4C-alkyl, 3-7C-cycloalkyl or 3-7C-cycloalkylmethyl,
- R23 is hydrogen, 1-4C-alkyl, 3-7C-cycloalkyl or 3-7C-cycloalkylmethyl,
- or R22 and R23 together and with inclusion of the nitrogen atom to which they are bonded, form a 1-pyrrolidinyl-, 1-piperidinyl-, 1-piperazinyl, 1-(1-4C-alkyl)-piperazin-4-yl-, 1-hexahydroazepinyl-, 4-morpholinyl, 4-thiomorpholinyl-, thiomorpholin-1-oxide-4-yl-, thiomorpholin-1,1-dioxide-4-yl-, pyr-rolidin-2,5-dione-1-yl-, morpholin-3,5-dione-4-yl-, piperidin-2,6-dione-1-yl, 4,4-dimethyl-piperidin-2,6-dione-1-yl or a 1-methyl-imidazolidine-2,4-dione-3-yl-ring or a isoindol-1,3-dione-2-yl-ring-system,
- n is an integer from 1 to 4,
- m is an integer from 1 to 4,

and the salts of these compounds.

- 2. Compounds of formula 1 according to claim 1, in which
- R1 is 1-4C-alkyl,

R2 is 1-4C-alkyl,

R3 represents a phenyl derivative of formulae (a) or (b)



wherein

R4 is 1-2C-alkoxy or 1-2C-alkoxy which is completely or predominantly substituted by fluorine,

R5 is 1-2C-alkoxy or 1-2C-alkoxy which is completely or predominantly substituted by fluorine,

R6 is 1-2C-alkoxy or 1-2C-alkoxy which is completely or predominantly substituted by fluorine,

R7 is methyl and

R8 is hydrogen,

or wherein

R7 and R8 together and with inclusion of the two carbon atoms, to which they are bonded, form a spiro-linked cyclopentane, cyclohexane, tetrahydrofuran or tetrahydropyran ring,

R9 is -C(O)-R10, $-S(O)_2-R14$, $-(CH_2)_n-C(O)-R18$ or $-C(O)-(CH_2)_m-R21$,

R10 is phenyl or phenyl substituted by R13,

R13 is 1-4C-alkyl or 1-4C-alkoxy,

R14 is -N(R15)R16, phenyl or phenyl substituted by R17,

R15 is hydrogen or 1-4C-alkyl,

R16 is hydrogen or 1-4C-alkyl,

R17 is halogen, nitro, cyano, 1-4C-alkyl, 1-4C-alkoxy or 1-4C-alkoxy which is completely or predominantly substituted by fluorine,

R18 is -N(R19)R20,

R19 is hydrogen or 1-4C-alkyl,

R20 is hydrogen or 1-4C-alkyl,

or R19 and R20 together and with inclusion of the nitrogen atom to which they are bonded, form a 1-pyrrolidinyl-, 1-piperidinyl-, 1-piperazinyl, 1-(1-4C-alkyl)-piperazin-4-yl-, 1-hexahydroazepinyl-, 4-morpholinyl or 4-thiomorpholinyl-ring,

R21 is -N(R22)R23,

R22 is hydrogen or 1-4C-alkyl,

R23 is hydrogen or 1-4C-alkyl,

or R22 and R23 together and with inclusion of the nitrogen atom to which they are bonded, form a 1-pyrrolidinyl-, 1-piperidinyl-, 1-piperazinyl, 1-(1-4C-alkyl)-piperazin-4-yl-, 1-hexahydroazepinyl-, 4-morpholinyl, 4-thiomorpholinyl-, pyrrolidin-2,5-dione-1-yl-, morpholin-3,5-dione-4-yl-, piperidin-2,6-

dione-1-yl, 4,4-dimethyl-piperidin-2,6-dione-1-yl or a 1-methyl-imidazolidine-2,4-dione-3-yl-ring or a isoindol-1,3-dione-2-yl-ring-system,

n is an integer from 1 to 4,

m is an integer from 1 to 4,

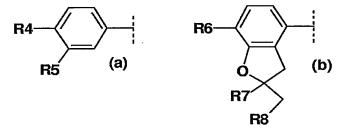
and the salts of these compounds.

3. Compounds of formula 1 according to claim 1, in which

R1 is methyl or ethyl,

R2 is methyl or ethyl,

R3 represents a phenyl derivative of formulae (a) or (b)



wherein

R4 is methoxy, ethoxy or difluoromethoxy,

R5 is methoxy, ethoxy or difluoromethoxy,

R6 is methoxy, ethoxy or difluoromethoxy,

R7 is methyl and

R8 is hydrogen,

or wherein

R7 and R8 together and with inclusion of the two carbon atoms, to which they are bonded, form a spiro-linked cyclopentane, cyclohexane, tetrahydrofuran or tetrahydropyran ring,

R9 is -C(O)-R10,

R10 is phenyl or phenyl substituted by R13,

R13 is 1-4C-alkyl or 1-4C-alkoxy,

and the salts of these compounds.

4. Compounds of formula 1 according to claim 1, in which

R1 is methyl or ethyl,

R2 is methyl or ethyl,

R3 represents a phenyl derivative of formulae (a) or (b)

wherein

R4 is methoxy, ethoxy or difluoromethoxy,

R5 is methoxy, ethoxy or difluoromethoxy,

R6 is methoxy, ethoxy or difluoromethoxy,

R7 is methyl and

R8 is hydrogen,

or wherein

R7 and R8 together and with inclusion of the two carbon atoms, to which they are bonded, form a spiro-linked cyclopentane, cyclohexane, tetrahydrofuran or tetrahydropyran ring,

R9 is -S(O)₂-R14,

R14 is -N(R15)R16, phenyl or phenyl substituted by R17,

R15 is hydrogen or 1-4C-alkyl,

R16 is hydrogen or 1-4C-alkyl,

R17 is halogen, nitro, cyano, 1-4C-alkyl, 1-4C-alkoxy or 1-4C-alkoxy which is completely or predominantly substituted by fluorine,

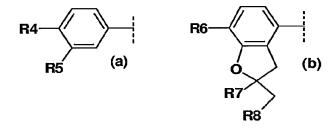
and the salts of these compounds.

5. Compounds of formula 1 according to claim 1, in which

R1 is methyl or ethyl,

R2 is methyl or ethyl,

R3 represents a phenyl derivative of formulae (a) or (b)



wherein

R4 is methoxy, ethoxy or difluoromethoxy,

R5 is methoxy, ethoxy or difluoromethoxy,

R6 is methoxy, ethoxy or difluoromethoxy,

R7 is methyl and

R8 is hydrogen,

or wherein

R7 and R8 together and with inclusion of the two carbon atoms, to which they are bonded, form a spiro-linked cyclopentane, cyclohexane, tetrahydrofuran or tetrahydropyran ring,

R9 is $-(CH_2)_n - C(O) - R18$,

R18 is -N(R19)R20,

R19 is hydrogen or 1-4C-alkyl,

R20 is hydrogen or 1-4C-alkyl,

or R19 and R20 together and with inclusion of the nitrogen atom to which they are bonded, form a 1-pyrrolidinyl-, 1-piperidinyl-, 1-piperazinyl, 1-(1-4C-alkyl)-piperazin-4-yl-, 1-hexahydroazepinyl-, 4-morpholinyl or 4-thiomorpholinyl-ring,

n is 1 or 2,

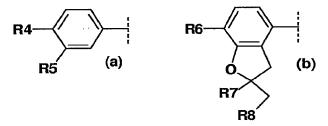
and the salts of these compounds.

6. Compounds of formula 1 according to claim 1, in which

R1 is methyl or ethyl,

R2 is methyl or ethyl,

R3 represents a phenyl derivative of formulae (a) or (b)



wherein

R4 is methoxy, ethoxy or difluoromethoxy,

R5 is methoxy, ethoxy or difluoromethoxy,

R6 is methoxy, ethoxy or difluoromethoxy,

R7 is methyl and

R8 is hydrogen,

or wherein

R7 and R8 together and with inclusion of the two carbon atoms, to which they are bonded, form a spiro-linked cyclopentane, cyclohexane, tetrahydrofuran or tetrahydropyran ring,

R9 is $-C(O)-(CH_2)_m-R21$,

R21 is -N(R22)R23,

R22 is hydrogen or 1-4C-alkyl,

R23 is hydrogen or 1-4C-alkyl,

or R22 and R23 together and with inclusion of the nitrogen atom to which they are bonded, form a 1-pyrrolidinyl-, 1-piperidinyl-, 1-piperazinyl, 1-methyl-piperazin-4-yl-, 1-hexahydroazepinyl-, 4-morpholinyl, 4-thiomorpholinyl-, pyrrolidin-2,5-dione-1-yl-, morpholin-3,5-dione-4-yl-, piperidin-2,6-dione-1-yl or a 1-methyl-imidazolidine-2,4-dione-3-yl-ring or a isoindol-1,3-dione-2-yl-ring-system,

m is 1,

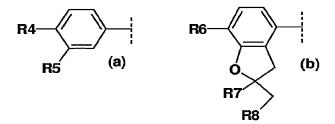
and the salts of these compounds.

7. Compounds of formula 1 according to claim 1, in which

R1 is methyl or ethyl,

R2 is methyl or ethyl,

R3 represents a phenyl derivative of formulae (a) or (b)



wherein

R4 is methoxy or ethoxy,

R5 is methoxy or ethoxy,

R6 is methoxy,

R7 is methyl and

R8 is hydrogen,

R9 is -C(O)-R10,

R10 is phenyl or phenyl substituted by R13,

R13 is methoxy,

and the salts of these compounds.

8. Compounds of formula 1 according to claim 1, in which

R1 is methyl or ethyl,

R2 is methyl or ethyl,

R3 represents a phenyl derivative of formulae (a) or (b)

wherein

R4 is methoxy or ethoxy,

R5 is methoxy or ethoxy,

R6 is methoxy,

R7 is methyl and

R8 is hydrogen,

R9 is -S(O)₂-R14,

R14 is -N(R15)R16, phenyl or phenyl substituted by R17,

R15 is methyl,

R16 is methyl,

R17 is cyano, methyl, methoxy or trifluoromethoxy,

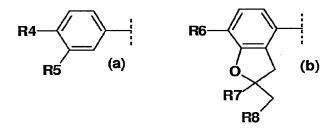
and the salts of these compounds.

9.2 Compounds of formula 1 according to claim 1, in which

R1 is methyl or ethyl,

R2 is methyl or ethyl,

R3 represents a phenyl derivative of formulae (a) or (b)



wherein

R4 is methoxy or ethoxy,

R5 is methoxy or ethoxy,

R6 is methoxy,

R7 is methyl and

R8 is hydrogen,

R9 is $-(CH_2)_{rr}-C(O)-R18$,

R18 is -N(R19)R20,

R19 is hydrogen,

R20 is hydrogen,

or R19 and R20 together and with inclusion of the nitrogen atom to which they are bonded, form a 4-morpholinyl-ring,

n is 1 or 2,

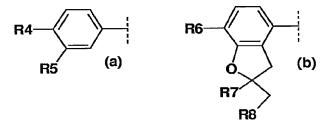
and the salts of these compounds.

10. Compounds of formula 1 according to claim 1, in which

R1 is methyl or ethyl,

R2 is methyl or ethyl,

R3 represents a phenyl derivative of formulae (a) or (b)



wherein

R4 is methoxy or ethoxy,

R5 is methoxy or ethoxy,

R6 is methoxy,

R7 is methyl and

R8 is hydrogen,

R9 is $-C(O)-(CH_2)_m-R21$,

R21 is -N(R22)R23,

or R22 and R23 together and with inclusion of the nitrogen atom to which they are bonded, form a 1-methyl-piperazin-4-yl-, pyrrolidin-2,5-dione-1-yl- or a morpholin-3,5-dione-4-yl-ring or a isoindol-1,3-dione-2-yl-ring-system,

m is 1,

and the salts of these compounds.

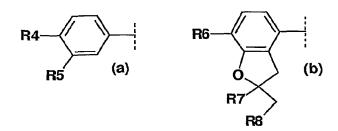
11. Compounds of formula 1 according to claim 1, in which

R1 is 1-4C-alkyl and

R2 is 1-4C-alkyl,

R3 represents a phenyl derivative of formulae (a) or (b)

0.5



wherein

R4 is 1-4C-alkoxy or 1-4C-alkoxy which is completely or predominantly substituted by fluorine, R5 is 1-8C-alkoxy, 3-7C-cycloalkoxy, 3-7C-cycloalkylmethoxy, or 1-4C-alkoxy which is completely or predominantly substituted by fluorine,

R6 is 1-4C-alkoxy, 3-5C-cycloalkoxy, 3-5C-cycloalkylmethoxy, or 1-4C-alkoxy which is completely or predominantly substituted by fluorine,

R7 is 1-4C-alkyl and

R8 is hydrogen or 1-4C-alkyl,

or wherein

R7 and R8 together and with inclusion of the two carbon atoms, to which they are bonded, form a spiro-linked 5-, 6- or 7-membered hydrocarbon ring, optionally interrupted by an oxygen or sulphur atom.

R9 is -C(O)R10, -S(O)₂-R14, -(CH₂)_n-C(O)-R18 or -C(O)-(CH₂)_m-R21,

R10 is 1-4C-alkyl, -N(R11)R12, phenyl or phenyl substituted by R13,

R11 is hydrogen, 1-4C-alkyl, 3-7C-cycloalkyl or 3-7C-cycloalkylmethyl,

R12 is hydrogen, 1-4C-alkyl, 3-7C-cycloalkyl or 3-7C-cycloalkylmethyl,

or R11 and R12 together and with inclusion of the nitrogen atom to which they are bonded, form a 1-pyrrolidinyl-, 1-piperidinyl-, 1-piperazinyl, 1-(1-4C-alkyl)-piperazin-4-yl-, 1-hexahydroazepinyl-, 4-morpholinyl, 4-thiomorpholinyl-, thiomorpholin-1-oxide-4-yl- or thiomorpholin-1,1-dioxide-4-yl-ring,

R13 is hydroxyl, halogen, nitro, cyano, hydroxycarbonyl, 1-4C-alkyl, trifluoromethyl, 1-4C-alkoxy, 1-4C-alkoxy which is completely or predominantly substituted by fluorine, 1-4C-alkoxycarbonyl, amino, mono- or di-1-4C-alkylamino, aminocarbonyl, mono- or di-1-4C-alkylaminocarbonyl, 1-4C-alkylcarbonyl, 1-4C-alkylcarbonylamino or 1-4C-alkylcarbonyloxy,

R14 is 1-4C-alkyl, -N(R15)R16, phenyl or phenyl substituted by R17,

R15 is hydrogen, 1-4C-alkyl, 3-7C-cycloalkyl or 3-7C-cycloalkylmethyl,

R16 is hydrogen, 1-4C-alkyl, 3-7C-cycloalkyl or 3-7C-cycloalkylmethyl,

or R15 and R16 together and with inclusion of the nitrogen atom to which they are bonded, form a 1-pyrrolidinyl-, 1-piperidinyl-, 1-piperazinyl, 1-(1-4C-alkyl)-piperazin-4-yl-, 1-hexahydroazepinyl-, 4-morpholinyl, 4-thiomorpholinyl-, thiomorpholin-1-oxide-4-yl- or thiomorpholin-1,1-dioxide-4-yl-ring,

R17 is hydroxyl, halogen, nitro, cyano, carboxyl, 1-4C-alkyl, trifluoromethyl, 1-4C-alkoxy, 1-4C-alkoxy which is completely or predominantly substituted by fluorine, 1-4C-alkoxycarbonyl, amino, mono-

or di-1-4C-alkylamino, aminocarbonyl, mono- or di-1-4C-alkylaminocarbonyl, 1-4C-alkylcarbonyl, 1-4C-alkylcarbonylamino or 1-4C-alkylcarbonyloxy,

R18 is -N(R19)R20,

R19 is hydrogen, 1-4C-alkyl, 3-7C-cycloalkyl or 3-7C-cycloalkylmethyl,

R20 is hydrogen, 1-4C-alkyl, 3-7C-cycloalkyl or 3-7C-cycloalkylmethyl,

or R19 and R20 together and with inclusion of the nitrogen atom to which they are bonded, form a 1-pyrrolidinyl-, 1-piperidinyl-, 1-piperazinyl, 1-(1-4C-alkyl)-piperazin-4-yl-, 1-hexahydroazepinyl-, 4-morpholinyl, 4-thiomorpholinyl-, thiomorpholin-1-oxide-4-yl- or thiomorpholin-1,1-dioxide-4-yl-ring,

R21 is -N(R22)R23,

R22 is hydrogen, 1-4C-alkyl, 3-7C-cycloalkyl or 3-7C-cycloalkylmethyl,

R23 is hydrogen, 1-4C-alkyl, 3-7C-cycloalkyl or 3-7C-cycloalkylmethyl,

or R22 and R23 together and with inclusion of the nitrogen atom to which they are bonded, form a 1-pyrrolidinyl-, 1-piperidinyl-, 1-piperazinyl, 1-(1-4C-alkyl)-piperazin-4-yl-, 1-hexahydroazepinyl-, 4-morpholinyl, 4-thiomorpholinyl-, thiomorpholin-1-oxide-4-yl-, thiomorpholin-1,1-dioxide-4-yl- or a pyrrolidin-2,5-dione-1-yl-ring,

n is an integer from 1 to 4,

m is an integer from 1 to 4,

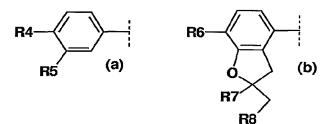
and the salts of these compounds.

12. Compounds of formula 1 according to claim 1, in which

R1 is 1-4C-alkyl,

R2 is 1-4C-alkyl,

R3 represents a phenyl derivative of formulae (a) or (b)



ξ.

wherein

R4 is 1-2C-alkoxy or 1-2C-alkoxy which is completely or predominantly substituted by fluorine, R5 is 1-4C-alkoxy,

R6 is 1-2C-alkoxy or 1-2C-alkoxy which is completely or predominantly substituted by fluorine, R7 is methyl and

R8 is hydrogen,

or wherein

R7 and R8 together and with inclusion of the two carbon atoms, to which they are bonded, form a spiro-linked cyclopentane, cyclohexane, tetrahydrofuran or tetrahydropyran ring,

R9 is $-S(O)_2-R14$, $-(CH_2)_n-C(O)-R18$ or $-C(O)-(CH_2)_m-R21$,

R14 is phenyl or phenyl substituted by R17,

R17 is halogen, nitro, cyano, 1-4C-alkyl or 1-4C-alkoxy,

R18 is -N(R19)R20,

R19 is hydrogen or 1-4C-alkyl,

R20 is hydrogen or 1-4C-alkyl,

or R19 and R20 together and with inclusion of the nitrogen atom to which they are bonded, form a 1-pyrrolidinyl-, 1-piperidinyl-, 1-piperazinyl, 1-(1-4C-alkyl)-piperazin-4-yl-, 1-hexahydroazepinyl-, 4-morpholinyl or 4-thiomorpholinyl-ring,

R21 is -N(R22)R23,

R22 is hydrogen or 1-4C-alkyl,

R23 is hydrogen or 1-4C-alkyl,

or R22 and R23 together and with inclusion of the nitrogen atom to which they are bonded, form a 1-pyrrolidinyl-, 1-piperidinyl-, 1-piperazinyl, 1-(1-4C-alkyl)-piperazin-4-yl-, 1-hexahydroazepinyl-, 4-morpholinyl, 4-thiomorpholinyl- or a pyrrolidin-2,5-dione-1-yl-ring,

n is an integer from 1 to 4,

m is an integer from 1 to 4,

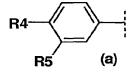
and the salts of these compounds.

13. Compounds of formula 1 according to claim 1, in which

R1 is methyl,

R2 is methyl,

R3 represents a phenyl derivative of formula (a)



wherein

R4 is methoxy or ethoxy,

R5 is methoxy or ethoxy,

R9 is $-S(O)_2-R14$, $-(CH_2)_n-C(O)-R18$ or $-C(O)-(CH_2)_m-R21$,

R14 is 2-cyanophenyl,

R18 is amino or 4-morpholinyl,

R21 is pyrrolidin-2,5-dione-1-yl,

n is 1 or 2,

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m is 1,

and the saits of these compounds.

- 14. Compounds according to claim 1 for use in the treatment of diseases.
- 15. Pharmaceutical compositions containing one or more compounds according to claim 1 together with the usual pharmaceutical auxiliaries and/or carrier materials.
- 16. Use of compounds according to claim 1 for the preparation of pharmaceutical compositions for the treatment of airway disorders.
- 17. A method for treating an illness treatable by the administration of a PDE4 inhibitor in a patient comprising administering to said patient in need thereof a therapeutically effective amount of a compound as claimed to claim 1.
- 18. A method for treating airway disorders in a patient comprising administering to said patient a therapeutically effective amount of a compound as claimed in claim 1.